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CRITERIA FOR BEAM ABORT IN PEP-II

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Assuming that PEP-II rings need the beam abort system, we discussed how this system will know when to abort the beam? What effects and what diagnostics to use for a trigger?

All possible candidates for a trigger could be divided on two types: a) beam-based triggers and b) equipment failure triggers. The former use diagnostics that monitor beam behavior. The latter uses diagnostics that monitor some vital systems.

Equipment failure trigger.

We found two obvious reasons for beam abort because of an equipment failure.

1. If there is a vacuum trip, the gate valves around the RF will shut off and we need to abort the beam in about 7 microsec. (time for one turn around the ring) before the gates valves close. Thus, the signal which triggers the gate valves must first trigger the beam abort.

2. Beam abort must also occur following the fault of any klystron. According to S. Heifets (PEP-II AP Note 40-93), the beam will circulate only a few turns after the klystron fault. (The possibility of keeping control of coupled-bunch growth when a klystron trips off seems difficult. While not completely impossible, it would require a separate energy-detector pickup, narrow-band feedback circuit and frequency control for the unpowered cavities.)

The fault of almost any magnet power supply is also dangerous. But we decided that there are too many of them to include into the trigger, since it will increase the probability of the false triggering.

This kind of the equipment failure must be monitored by the beam-based trigger.

Beam-based trigger.

For such a trigger we need to detect any critical situation, which will inevitably result in beam loss. The following indications and diagnostics could be potentially used:

1. The sharp excess of a detector background over normal operation conditions.

2. We recommend equipping the collimators with loss monitors and using them as an alarm system.

3. The wiggler area in the LER will require special protection against large vertical orbit distortions, since wiggler radiation can only be absorbed by dedicated absorbers. Direct monitoring of the synchrotron radiation fan seems necessary.

Finally, the abort itself should be fast (one turn) and reliable. We need an abort kicker that will go from off to fully on during the passage of the ion-clearing gap (about 0.4 microsec.). However, the clearing gap causes beam-loading transients and a possibility to operate without gap is also considered.